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THE

Great Earthquake

OF

1894.

A COMPLETE REPORT OF THE EFFECTS OF THE RECENT

GREAT EARTHQUAKE.



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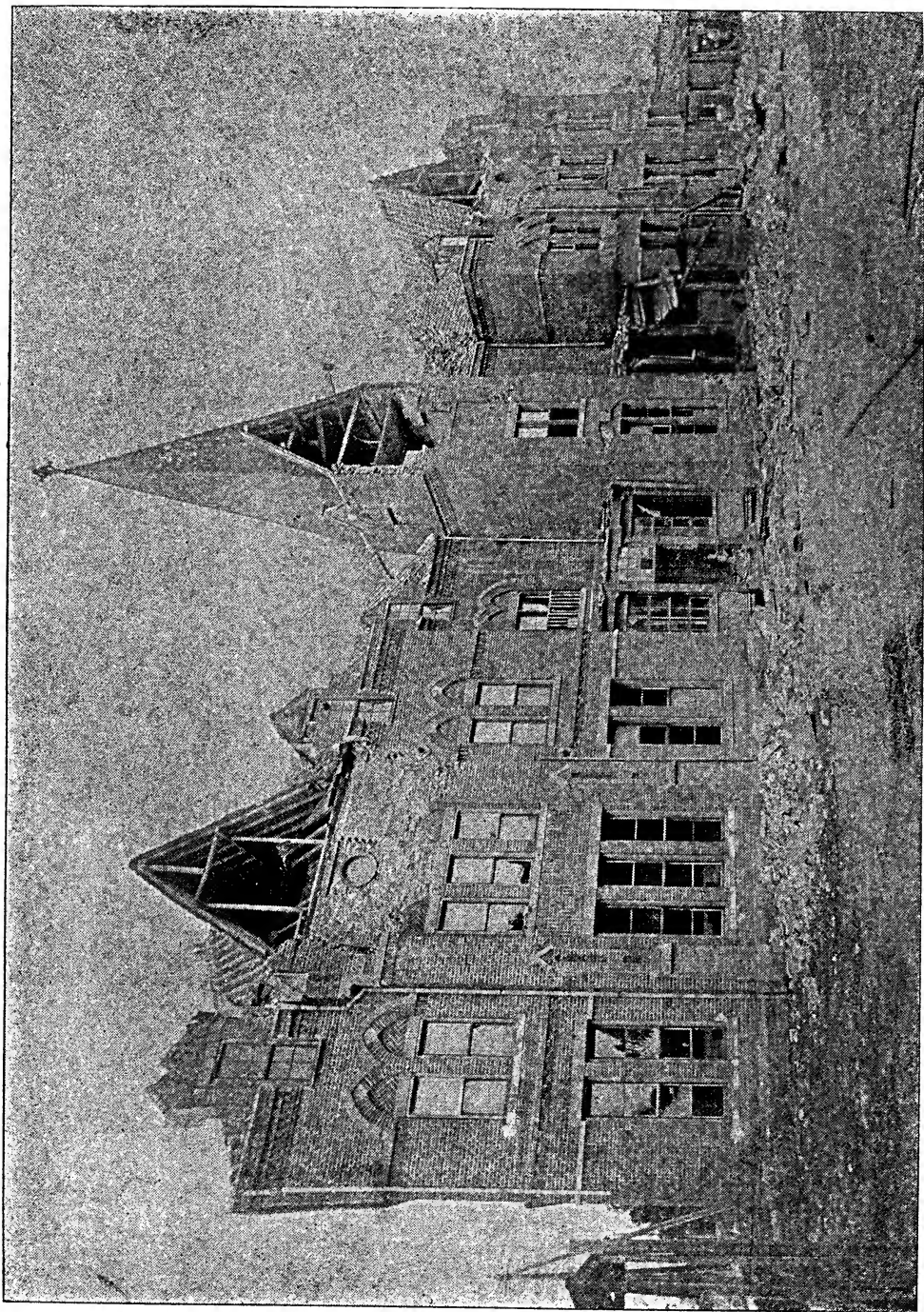
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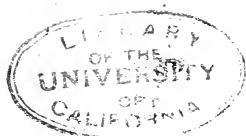
TO THE
ABSTRACTS

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St. Paul's School at Tsukiji, Tokyo.


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EARTHQUAKES

I N

J A P A N .



ARTHQUAKES are frequent in Japan, says J. J. REIN in his able interesting work on this country. Such violent disturbances, he continues, fortunately occur but seldom, that is to say, according to previous experience and expectation, about one in every twenty years. The last destructive earthquake, however, our author observes, took place in the autumn of 1855, so that already twenty-five years have elapsed without a recurrence and the old rule apparently no longer holds. This was written in 1880, and although in that year a shock of considerable violence was felt it was not until the morning of the 28th October, 1891, that a seismic disturbance of any startling dimensions transpired. That, however, amply atoned for any delay, and by the extent of the area affected, and the terrific devastation wrought, maintained the reputation of Japan for being subject to such fearful visitations. Less extensive in area but more serious locally the recent

shock will undoubtedly be looked upon as the most severe Yokohama has experienced since the advent of foreigners. It was a startling reminder that this is the land of earthquakes, and, indeed, Japanese histories teem with incidents of the phenomena. There is a legend that in 286 B.C., Fujiyama was formed, as well as Lake Biwa, by one of these subterranean upheavals. The earliest authentic instance is that which occurred in 416 A.D., when the Imperial Palace was thrown to the ground. Again in 599, the buildings throughout the province of Yamato were all destroyed, and special prayers were ordered to be offered up to the deity of earthquakes. In 679, a tremendous shock caused many fissures, or chasms, to open in the province of Chikuzen and Chikugo, in Kiushiu, the largest of these fissures being four miles in length and twenty feet in width. In 685, a terrible disturbance occurred. Mountains were toppled over, rivers overflowed and tremendous destruction resulted. In the province of Tosa an area of five million tsubo sank into the sea. But coming to a later period, we find that in 1702 the lofty walls of the outside and inside

moats of the castle of Yedo were destroyed, tidal waves broke along the coast in the vicinity, and the road leading through the famous pass of Hakone, was closed up by alteration in the surface of the earth. Indeed Tokyo has been frequently victimized, and fire in nearly every instance has supplemented the catastrophe. In 1703, such a calamity happened costing, it is estimated, the lives altogether of 200,000 persons, and laying the capital in ruins. We have not space here to refer to all the ravages of this terrible visitant, but confining ourselves to the present century we note that Dewa was the theatre of repeated concussions in 1804, and in 1822 150 shocks were felt in Tokyo in the course of three days. Once more, in 1828, an earthquake occurred in Echigo, and 30,000 men, women and children were destroyed. Two years later Kioto was afflicted. The Tokugawa Palace, Nijo, was among the buildings overthrown while the number of people slain was described as innumerable. It was not one shock, but three, following each other in rapid succession at four in the afternoon, the ground rocking like waves. The affrighted people were too terror stricken to do anything and it was days before their senses returned to them. Other shocks occurred in the same year, in 1835, and 1847, and then in 1854 the provinces of Suruga, Mikawa, Ise, Totomi, Iga, Settsu and Harima, as well as the whole of Shikoku were severely shaken. It was this earthquake which destroyed the town of Shimoda, in the province of Izu, which had been opened as a foreign port in Japan, while a Russian frigate, the *Diana*, lying in harbour

at the time, was so severely damaged by the shock, and the waves which it raised that she had to be abandoned. The last great shock, prior to the Gifu catastrophe, occurred on November 10th, 1855. On that occasion Tokyo again suffered. The chief shock occurred at night and the city was immediately converted into a rubbish heap, thirty fires breaking out in various quarters and completing the terrible work of destruction. For two weeks the shocks were almost continuous though of decreasing magnitude. It is calculated that 16,000 buildings were overthrown, and 104,000 lives lost in that awful cataclysm. Curiously, then as now, the area of disturbance was very limited, and it gave substance to the supposition that the volcanic agencies at work on Vries Island may not have been altogether unconnected with the disturbance. But of that we may have something to say hereafter.

MANY KILLED AND INJURED.

(From Wednesday's "Gazette.")

THE earthquake which occurred about two o'clock on Wednesday afternoon, the 20th June, was a short one, but as sharp as any experienced by most foreign residents in Japan. One resident who had lived in earthquake countries all his life—and in countries where shocks are of almost daily occurrence—informed our reporter that he had never before experienced such a shock. As soon as the violence of the shock was realised people rushed from their houses into the streets, and did not venture back until there was little fear of recurrence. On the boats in the harbour, we understand, the earthquake also created a commotion. That the shock was

not a local one is shown by the deaths and damages to property at Tokyo. Considering the violence of the shaking it is extraordinary that the damages have not been greater in Yokohama; but as it is, the number of fallen chimneys and smashed roofs in the city is beyond count; while on the Bluff thousands of dollars worth of ornaments, &c., have been destroyed. These damages, however, are insignificant compared with the calamity which occurred at Messrs. Wilson and Co.'s go-downs at Nos. 258 and 260, Settlement. These buildings are quite new, having been only recently completed. They are of red brick, with white stone dressings. Between the tea-firing godowns at the rear and the go-downs abutting on the road is a space about eighteen feet wide, which was covered with corrugated iron and supported by uprights and beams, tied together with iron bolts; and above this was a light wooden platform. The earthquake shock had the effect of toppling over a triangular-shaped portion of the upright wall of the front go-down, and this fell on to the end of the wooden platform, smashed through the corrugated iron roof and buried a number of men, women, and children in several tons of debris. As might be expected, this crash, together with the quivering of the building, filled the people engaged in the go-downs with fear; but as soon as the shock ceased, and the frightened people had to some extent recovered from the excitement, the work of digging out the buried persons was commenced. About twenty-five—men, women, and children—were covered by the fallen bricks and mortar. All were eventually extricated; and at the time of going to press last evening we were informed by the police that one man, whose head and limbs were injured, died after lingering an hour and a half; and the life of an-

other was despaired of. The injured were removed to the charity hospital at Negishi. The children's injuries fortunately were slight. The disaster created the greatest excitement in the city; and during the whole of the afternoon Messrs. Wilson's establishment was surrounded by large crowds.

Throughout the Settlement and the Bluff damages are reported. There is probably not a foreign house in Yokohama where some damage has not been done. The upheaval upset tables and dashed vases, curios and crockeryware to the ground. The floor of Messrs. Arthur & Bond's curio store on the Bund was strewn with broken curios, among the number being some valuable vases. The firm estimate the damages at \$1,000. At Mr. Kuhn's and at Messrs. Deakin Brothers the damage was very slight.

In Honmura Road the roof of a brick building—a butcher's shop and a general store—slid off and the front of the building is cracked and is now hanging over towards the road. Fortunately no-one was injured. A small house at the rear of the Baltimore Inn, in the same locality, also collapsed; while the walls of the Cosmopolitan Inn were cracked and some big blocks of stone fell out of the front and side walls.

At No. 63, in Main Street, a chimney has been completely twisted. Every stone in it is now separate; and it seems a miracle that it did not fall in the shock.

The *Eastern World Office* in Water Street also had a bad shaking. The chimneys seeming on the point of falling, stakes, ropes, and danger notices have been placed round the building.

Chimney copings at Messrs. Cabeldu, Batchelor, and Schneider's houses at No. 80, Main Street, fell to the ground; but fortunately nobody was injured. The ceiling of a room in Mr. Cabeldu's house also came down.

Among a large number of other places where chimneys collapsed were Messrs. Isaacs and Brother's, No. 195; Messrs. Frazar & Co.'s, No. 200; and at a house occupied by a Chinaman at 183.

The chimney of a dwelling-house at No. 121 fell and smashed the roof of a press godown occupied by Mr. C. L. Eymard. In the rear of this building there was a most peculiar effect, the walls collapsing and leaving the frame standing.

At No. 124 a Chinese child was injured by a brick falling from a chimney, and at 153 the roof fell in.

In Aioicho, Nichome, a brick house fell and smashed part of the adjoining house. In Honcho-dori the only damage worthy of note is the fall of the roof of a brick house.

On the Bluff the earthquake created the greatest excitement and fear among residents. At many of the houses chimneys came down with a crash and every resident is bewailing the loss of treasured curios and crockeryware. In some houses the walls have been completely denuded of ornaments.

At Mr. C. K.-Marshall Martin's house at 265 three chimneys came down; at Mr. J. E. Beale's, No. 58, the chimney toppled over and fell through the roof; and chimneys also fell at Mr. J. A. Fraser's, No. 21, at No. 72, No. 85, the U. S. N. Hospital; while at the Convent one of the side walls has given way. A landslide occurred at Mandarin Bluff.

Communication by train with Kobe is interrupted.

LAND-SLIDES.

A portion of a cliff near the Ishikawa Primary School gave way, throwing down a large quantity of earth on to a small space below the cliff, from the compound of 1,426, Nakamura. Another land-slide

took place at Higashi-yato, several tons of loose earth falling and raising a dense cloud of dust which people in the Settlement took at first for a fire. In both cases, no one was injured nor was any damage caused to property.

A portion of the Noge range known as Zeikwan-yama, near the temple of Fukutoku-Inari, also gave way, but the falling earth stopped midway. Here, too, no damage was caused.

FURTHER PARTICULARS.

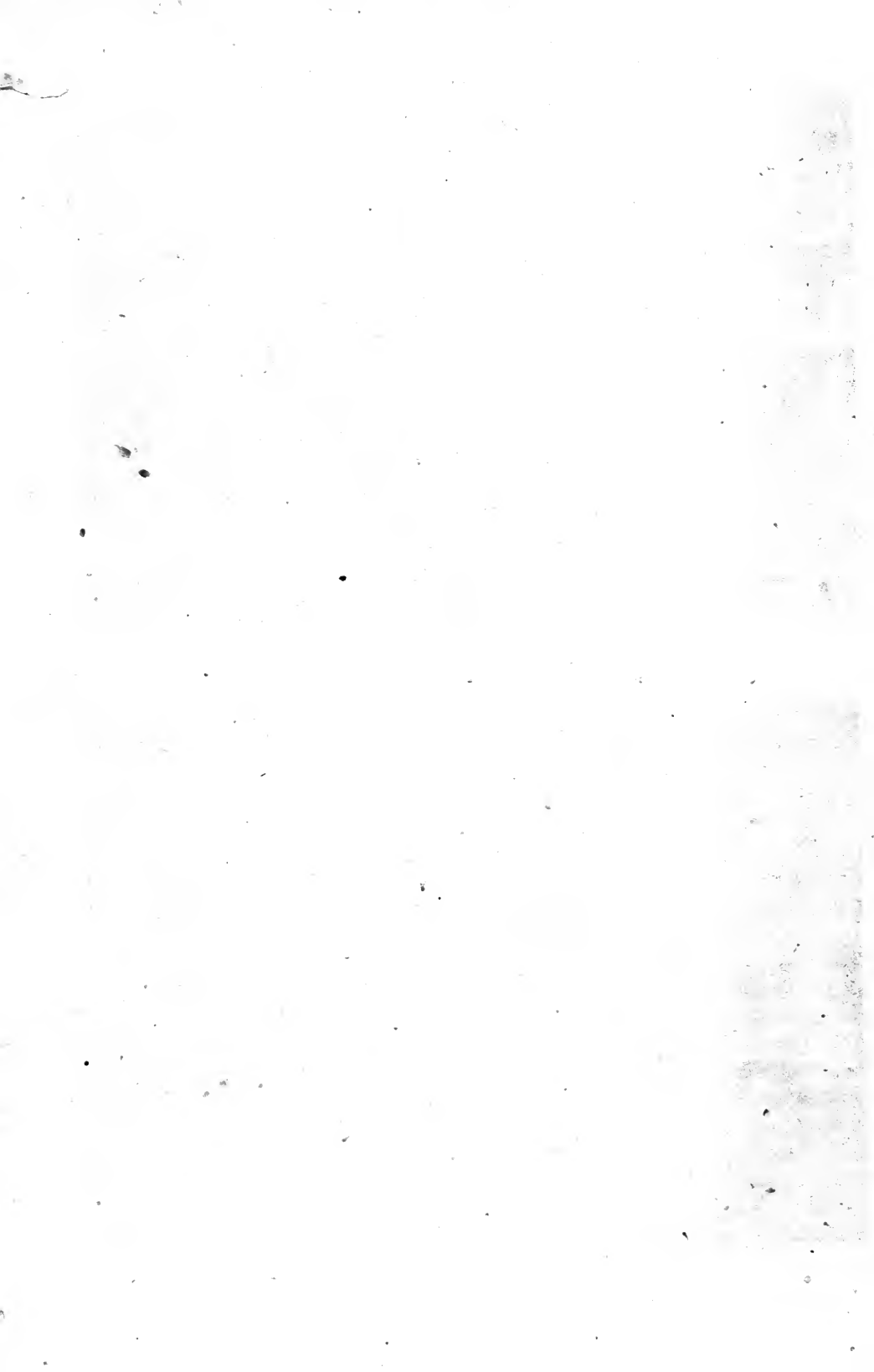
(From Thursday's "Gazette.")

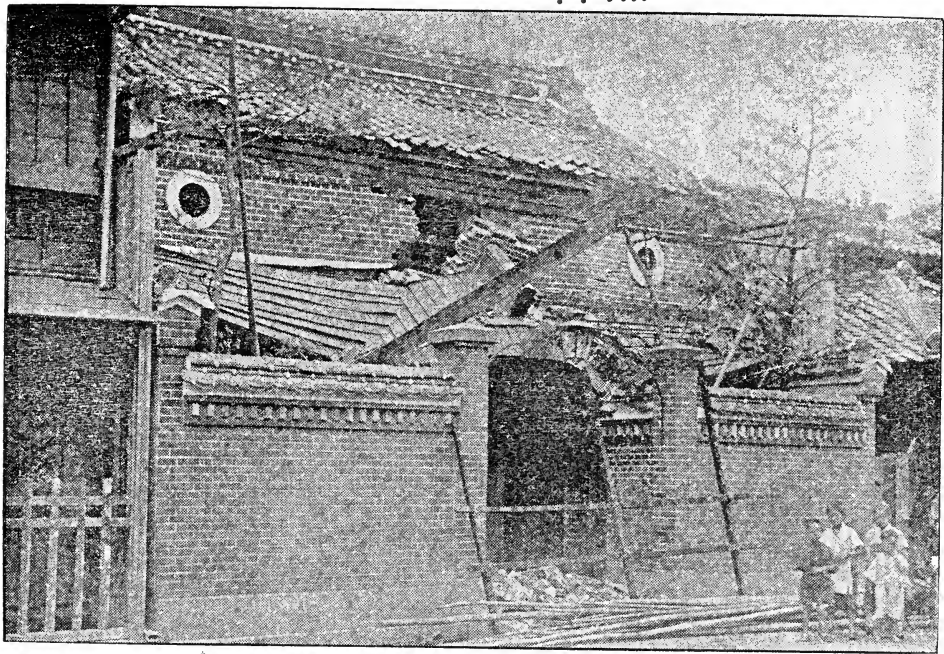
To attempt to give anything like a comprehensive list of the damages resulting from the shaking up which Yokohama experienced on Wednesday would be hopeless, for so far as can be gathered there is hardly a house in the Settlement or on the Bluff that has not suffered more or less injury. Clarendon House, which it was feared by many would not stand an earthquake, had a severe test and is reported to have stood it well. The proprietor says not a beam was heard to crack; several vases were thrown down from brackets, but the house moved like a solid rock. At Tokyo the earthquake proved more destructive than in Yokohama; while Kobe escaped the shock altogether.

The accident at Mr. Wilson's godown at No. 258 was more disastrous than was believed to be the case when we went to press on Wednesday night. Altogether 25 were buried in the debris—8 men and 17 women and girls. One man died an hour and a half after being rescued; and yesterday morning our representative was informed that three women died during the night in the Negishi Hospital, as the result of injuries to the head.

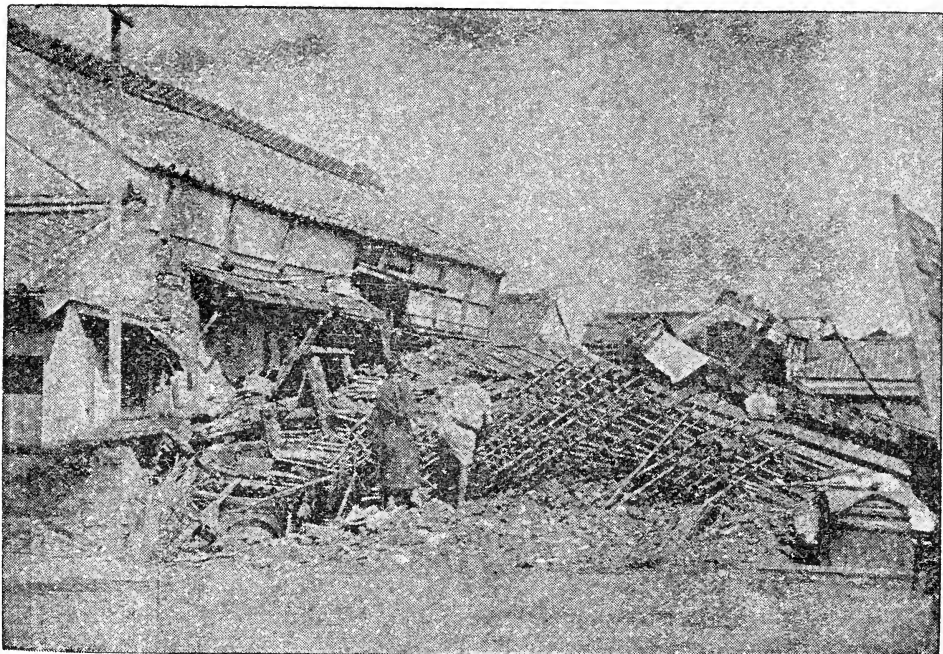
In the street up Yatozaka on the Bluff there were many fissures, the largest being 20 yards long and 5 inches wide. In the com-







TEA-HOUSE AT TSUKIJI, TOKYO.



SCENE AT ZAIMOKU-CHO, KYOBASHI-KU, TOKYO.



pound of 142 the cracks were very numerous, some being 2 feet deep and 8 or 9 inches wide. Nos. 36 and 39 were so dangerously damaged that the Police sent firemen and demolished the buildings completely, as they were likely to cause injuries to passers by. The Convent, No. 83, suffered greatly. In the damage of furniture, Mr. Smedley seems to have been one of the greatest sufferers, so far. Mrs. Hegt, 59, had a narrow escape with three children, a chimney top falling just behind her, and she fell to the ground unconscious. Fortunately the explosive storage was quite safe. A riki-sha-man of the Italian Consulate, Chuza by name, was knocked down by a brick falling, and was removed to Negishi Hospital but died the same night. About 50 houses suffered more or less.

At the time the shock occurred Mr. J. Cain's children were playing in the drawing room at No. 119. The shock brought down a chimney, which crashed through the roof and ceiling and fell into the room, causing considerable damage, but fortunately no-one was injured. At Mr. A. W. Payne's house at No. 132 a chimney fell, and the walls were fractured, while in the garden fissures a foot deep and 20 feet long were caused.

The Bluff Police summoned their full staff and firemen, and made all preparations possible for a recurrence of the shocks.

In the native town, there were no fatalities. A twelve-year-old girl, Kondo Fusa by name, in the employ of Tomoye Hanjiro, Hagoromochi Nichome, was injured on her left arm and foot, by the fall of a stone *torii* at the temple of Benten. Damage to property is not so small as at first believed. Roofs fell in, walls were fractured and tiles slid down from many houses. Curio and porcelain dealers suffered most. A house in Honcho Shichome, owned

by Mr. Wakao Ikuzo, and the office of the Asamatsu-gumi in Bentendori Rokuchome collapsed.

Three children were killed in Kawasaki by the fall of a stone wall of the Daishi temple.

WATERWORKS AND WIRE COMMUNICATIONS.

The Yokohama Waterworks seems to have suffered much by the earthquake. The water-supply, which had already become much diminished in the Ota reservoir, is now impure. A telegram from Hodogaya states that the iron pipes have leaked, and the engineers are busy in surveying the damage.

Telegraph and telephone wires were broken in many places and communication is interrupted, especially that to the north of Tokyo.

THE EARTHQUAKE IN TOKYO.

Another seismological convulsion has, writes our Tokyo correspondent, given Tokyo the worst shaking up it has had for thirty-eight years. On Wednesday afternoon promptly at 2 o'clock there was a low rumbling sound heard, and then the houses began to rock, at first only gently as if not fully prepared for the task, then the shaking became more rude and then ruthless. In a few moments the dust was seen to fly on the roofs, then tiles came battering down to the ground. For a few moments only the chimneys reeled and rocked as if trying to regain their balance and then came thundering down. At other places they broke through the roof and ceiling and came into the rooms. Such was the case at No. 23, Tsukiji, at the residence of Rev. David Thompson, D.D. Here the chimney of the one storey house fell through the roof and ceiling into the parlour, striking the keyboard of the piano as it had never before been struck, and smashing other furniture.

Among this latter also a writing table at which one of Mr. Thompson's daughters had been writing up to the very moment the shaking began. As the quaking became severer the young lady sprang up and left the room and had scarcely stepped out when down came the chimney with an awful crash, a large piece still unbroken striking the very spot where she had been writing only a moment before.

At Mr. A. Thompson's, the druggist, the East half of whose large house is occupied by Mr. Ambler, the chimneys on both sides came through roof and ceiling, on Mr. Ambler's side falling into nursery, and the nurse with great presence of mind quickly snatched away the small child from the bed on which it was lying. A moment later the child would have been dead. At No. 6, Rev. W. J. White's, the chimney fell through the roof and upstairs ceiling into the boy's bed-room. Had it occurred at night the two could hardly have escaped death or serious injury. At No. 49, a one storey building, both chimneys broke through the roof and ceiling. Fortunately the house was unoccupied at the time and hence no persons were killed or injured. The old stone building, No. 51, the Tract Repository, also suffered badly, the upper tier of stones just under the roof on the west side falling out to the street and also nearly all of the west half of the roof. But the saddest and worst remains yet to be told. The greatest loss sustained by any of the Foreign Missions is that by the American Episcopalians. The Saint Paul's brick school building, which had already been condemned as unfit for further occupancy, gave way on both the north and south sides. Here a Japanese connected with the school, and at the time in the building, thinking it safer outside no doubt, started to run out. He had only got away some three feet from the door when a large part of the brick

wall fell down, striking him on the head and then crushing him almost beyond recognition. He died in less than an hour afterwards. Another student also received serious injuries. Bishop McKim, who has his study in the tower of the new school building, was rushing down stairs when several large bricks struck him on the head. Fortunately he had a heavy stiff summer hat on so that he was not seriously injured. The beautiful brick church in Tsukiji, of this same Mission, was badly injured. So also the new Theological Hall. Both will no doubt have to be rebuilt, at a very considerable cost.

Thus it is throughout Tsukiji, at some places worse and at others not so bad. Most houses will have to be replastered outside and inside. Vases, dishes, wines and the like, were destroyed without number.

Out in the city it is no better than here. At one place ten are said to have perished by falling debris. A friend just sends a post-card saying that one student of his school perished. The Meiji Gakuin will have to be rebuilt. But for fuller reports we shall be obliged to wait a few days.

FROM ANOTHER CORRESPONDENT.

The earthquake here seems to have picked out different sections of the city upon which to shew its violence. Tsukiji suffered very badly, there is hardly a house without some damage to its chimneys. St. Paul's school, belonging to the A. E. Mission, is badly wrecked. A Japanese teacher was killed in trying to leave the building. Fortunately he was about the only person in it. This seems to be the one person hurt in Tsukiji, though there were several near escapes. Bishop McKim was only saved by the thick sun hat he had on.

At the Rokumei Kwan a porch roof fell, killing a coachman, a horse, and rendering

another horse useless and crushing the carriage. There are several chimneys lying on the roof of the Imperial Hotel. The Hotel Metropole seems uninjured. Trinity Church in Tsukiji is badly damaged, while it is said that the Shiba English Church is badly wrecked. The Pres. Mis. Buildings at Shirokane are badly damaged. It is said that there are several deaths in the city.

Ginza and its neighbourhood seems to have got off without a tile displaced.

AT THE IMPERIAL CASTLE.

In the Imperial Palace, there was fortunately no accident. Their Majesties taking shelter in the palace grounds. Chamberlains and Court ladies were sent to Akasaka Palace, where H.M. the Empress Dowager lives; but the Palace was not in the least damaged and Her Majesty was in the best of spirits. At 2.30, Imperial Princes, Ministers of State, and other high officials called at the Imperial Castle, Akasaka Palace, and Crown Prince's Palace. The only damage done to the Castle was in the cracking of some of the walls.

THE GOVERNMENT OFFICES.

Cabinet Building.—Through the falling of the chimneys, the roof was severely damaged, and the walls cracked and fell off. The shock coming as the Ministers of State were in consultation sitting round a table, bits of plaster fell upon them as they rushed out of the room.

Privy Council Building.—A chimney fell, and there was very little damage done.

Household Department.—An official, on seeing the west entrance slightly damaged, tried to run out and was injured. Attendants and boys were also slightly injured.

Foreign Office.—The tiles fell off in many places; and most chimneys have leaned dangerously. Though the Minister and Vice-Minister's residences are not perceptibly

damaged, the Private Secretary, Kure's residence was seriously damaged, a chimney falling through the roof, and the walls having cracked, the rooms are almost destroyed. Mr. Kure's family have left the house. The Private Secretary Nakada's residence has also suffered through cracks on the walls, and the stones on the eaves being almost dislodged, the house is in great danger of a collapse. Nearly half the residence of Mr. Sato, the Secretary, was destroyed by the wall of Prince Arisugawa's Palace, falling upon it, the part of the wall thus fallen being 12 feet high by 18 feet long. But no one was hurt either at the office or in the residences.

Home Department.—Nearly all the chimneys have fallen, six of them having pierced the roof into the rooms set apart for the Bureaux of Public Works, Prefectural Administration, Police Supervision and General Affairs, and the Secretariat, while a building behind the Department was completely destroyed. A paper-plasterer, Sato Seibei, was so seriously injured that it is believed he has since succumbed. Among those slightly injured, were three clerks, an attendant, and a workman come to repaint the building. Makino, a clerk, had a very narrow escape. A chimney fell through into his room and completely smashed the table at which he was writing; but he escaped unscathed. Mr. J. de Rijke, an employé of the Department, who is at present at Hakone, has an official residence in the Central Observatory compound. The chimney fell and broke the beams; Mrs. de Rijke had to take refuge in the Observatory with her son and daughter.

Finance Department.—The Vice-Minister and other high officials were in council when the shock occurred. They all ran out of the building, followed by the clerks. Clerk Mizoguchi was coming down, when the staircase came off, and he was severely injured in

the thigh. An attendant jumped out of a window; but just as he came on the ground, a chimney fell on top of him and buried him in its ruins. He was helped out; and after medical assistance had been called, the two men were sent to the Juntendo Hospital. The clerk is expected to live if his thigh can be mended. Six chimneys came down at the Department and destroyed three buildings. The *Official Gazette* office and a disused building for safes were seriously damaged.

War Department.—The chimneys of the Minister and Vice-Minister's rooms were knocked down, and walls in many places were cracked. Damages, however, were comparatively slight.

BARRACKS AND MILITARY SCHOOLS.

Imperial Body Guard.—Only a chimney came down in the First Infantry Regiment's barracks, while in those of the Second, a chimney made a hole through the building, while another is on the point of falling. In the Third Regiment's barracks, chimneys of the 3rd, 7th, and 8th companies' rooms fell while those of the 3rd and 4th made a hole in the building. In the 3rd, Lieutenant Kojiro, a volunteer conscript Oshikoji, two men and a tradesman were so seriously injured that they died soon after. Nine other men were slightly injured. The pillars of a bath-room broke and killed a man. Other barracks were more or less damaged, without, however, loss of life.

Arsenal.—A workman of the small-arms department was seriously hurt by falling on his head. Three or four chimneys also fell. Another was very seriously injured.

Naval Department.—The ceilings of several rooms fell through with the roof, besides falling walls and chimneys. The tiles of a godown in the compound also came down and severely injured a fireman. A trumpet-call was sounded at the Department and the offi-

cial roll was called over; fortunately no one was hurt or missing.

Judicial Department.—The walls cracked and fell in pieces. The officials all ran out, and two clerks were seriously injured, one in the ribs and the other in the legs. The Vice-Minister's carriage, which was waiting outside, was smashed in two by the horse taking fright and becoming restive.

Educational, and Agricultural and Commercial Departments.—These were more or less damaged by falling chimneys, but fortunately no one was hurt.

Communications Department.—Damages were slight, but a clerk tripped over a rope as he ran out and was so seriously hurt that his condition is declared precarious. Two or three other officials were slightly injured.

Damages are also reported from the other offices, but without any loss of life.

In the city itself, the earthquake appears to have caused great havoc. The most noteworthy, so far as are at present known, are as follows:—

KOJIMACHI-KU.

The stone-bank about 20 yards to the right of the Hanzo Gate fell to the extent of about 16 yards. The tiles of the Baba-saki Gate fell off. The Tokyo Girls' School, late Kobu Daigakko, at Toranomom, has lost its roof, while the walls have been cracked. The godown near the clock-tower has half collapsed. A godown in the Atarashibashi corner of the notorious Soina mansion is also in a similar condition. Cracks could also be seen on the walls of the Japan Building Co.'s offices. Numerous cracks have also been made on the walls of the Rokumeikwan. The porch fell, and a carriage of the Household Department which had been sent to take chairs belonging to that Department, was smashed to pieces as it was standing under it. One of the horses, died immediately, while the other is not expected

NIRONBASHI-KU.

to live. The driver was also seriously injured. A porter is also in a precarious condition, having been struck on the head by falling tiles. Several noblemen, who were in the building at the time, ran out without accident. At the Tokyo Hotel, a chimney fell through the roof and the ceiling, but no one was hurt. The house, however, leans, the wall coming off and furniture being seriously damaged. At the Sakurada Beer Company's works, a falling chimney injured two men. A jinrikishaman and his fare, a woman, fell into a ditch at Kioicho, but escaped with slight injuries. The German Legation and the official residences of the Minister President and the Educational Minister were slightly damaged, while the War Minister had to remove to his private residence. The Finance Minister's official residence has also suffered.

KANDA-KU.

Though the damages in this district were comparatively slight, there were more than ten small houses which had to be abandoned as being too dangerous, their smallness having prevented injuries. The students of the great private school, Kinjo-gakko, were leaving it when the shock took place. The roofing over the entrance gave way and killed one student and seriously injured another. A third jumped out of the second storey window, but was so seriously injured that he died soon after. Great confusion was caused at the bazaars with which the district abounds. Prince Komatsu's palace and Mr. Kono Tokama's residence were slightly injured. The cross of the Russian Church at Surugadai was slightly bent. A woman and her daughter injured their hips by jumping out of the second storey at the Misakiza Theatre, where five others were also hurt. The police reported yesterday evening that sixty houses were damaged in this district.

The walls of the Rice Exchange fell off; while the Stock Exchange was also seriously damaged. The great chimney of Yukosha, the paper-mill at Kakigara-cho, fell, as well as the front arcade of the Meiji-za Theatre. Many houses were damaged, especially the bookseller Uyeda's, doll-maker Kawabata's, the old building of the Kawamura Bank, the bookseller Maruya, and Viscount Toda's godowns. The total number of the injured in this district is eight.

KYOBASHI-KU.

This district has been the most seriously injured of all. At Tsukiji, the stone over the entrance of the St. Paul's School fell on the school officer Tamaki Kakunosuke, who died on the spot, and Mr. Kubo, a teacher, was also hurt. A jinrikisha in front was smashed to pieces, but the jinrikishaman escaped unhurt. A brick bath-house at Hatchobori was half destroyed, and two persons were killed and five injured. All the chimneys of the Hokkaido Colliery Railway Co.'s offices were knocked down. The brick-wall of the Koseikwan Assembly Hall fell and so seriously injured a mason at work on the wall that there is no hope of his recovery. At Honzaimoku-cho, a child of a member of the *Yomiuri Shimbun* staff was buried in the ruins of an earth wall, but he was safely extricated. At the Ishikawajima Shipbuilding yard, the roof of a brick godown, the chimney of a foundry, the cupola of a forge, and another chimney were knocked off. At the printing establishment of Shueisha, in Nishikonya-cho, the compositors and others rushed out of the workshop, and some of those who jumped out of windows fell into a well. A falling chimney seriously injured a workman at the Tsukiji Type Foundry. The *Kaishin Shimbun* office's roof was almost entirely destroyed; and also several persons were hurt

by jumping out of windows at the *Mezamashi Shimbun* office.

SHIBA-KU.

Damages to buildings in this district were great, among the sufferers being Count Ito's private residence, the Tokyo Hospital, Mr. Fukuzawa, and the Shibahama Detached Palace. In Udagawa-cho alone, 12 houses and 3 godowns were damaged. At Atago-shita-machi, a brick-building, 54 feet square and 18 feet high, was destroyed, and two women, aged 67 and 43, were killed as they ran out of the house. At Takanawa, a servant-girl was injured by tumbling walls, a woman at sake-dealer's was also hurt by wine-barrels coming down on her.

AZABU-KU AND ASAKUSA-KU.

The chimneys at Prince Kuni's, Mr. Matsuo's, and others' fell. The Azabu Chapel suffered severely. No one is believed to have been hurt. The walls of the Astronomical Observatory fell, but no injury has been suffered in the observatory itself. We have already referred to the Imperial Bodyguard's barracks. Long, sinuous cracks were made in the earth at Tameike and Reinanzaka. At the Aoyama Cemetery, half the stone walls and lanterns (toro) were destroyed.

YOTSUYA, KOISHIKAWA, AND USHIGOME.

Nothing serious has been reported from any of these distinct, the only accident taking place at the Arsenal.

HONGO-KU, SHITAYA-KU AND ASAKUSA-KU.

Half the tiles of the sake-dealer, Takasaki's house at Oiwake fell off. At Kinrokuchō a woman was buried under the ruins of a godown, but she was extricated with slight injuries. A clerk of the Home Department was injured on the head and feet at Tenjincho. The Imperial University escaped with very slight damages. At the Haruki-za Theatre, the audience kept very quiet, and

only two or three were slightly hurt. The Shitaya Police Station was damaged, while the exhibits at the Exhibition building at Ueno were nearly all turned upside down, and the stone *toro* were toppled over in the garden. The chimneys of the Tokyo Technical School at Asakusa fell, and also about 18 *tsubo* of the school wall gave way. At the Asakusa Park, a stone idol of Jiso tumbled over; the wall of the Ryouunkaku, the twelve-storied tower, fell down, but not the tower itself which still stands though out of the perpendicular; nearly all the bottles ranged at the grogshops behind the great temple were also tumbled over. At Hatagocho, a girl, aged 12, was seriously, and another child slightly, injured, while a servant-girl was killed.

HONGO-KU AND FUKAGAWA-KU.

In Honjo several houses lost their tiles and walls, while many godowns fell down, but no injury or death is reported except at the Kanegafuchi Cotton-mills, where over 10 hands are said to have been slightly hurt. At Fukagawa, however, by the falling of a godown belonging to the Tokyo Warehousing Co., near the water at Komatsucho, a boat was sunk, killing two and seriously injuring one of the three men in it. The bursting of a tank at the Tokyo Cotton Mill, caused injuries to 2 male and 12 female hands. An old woman was seriously hurt in the face at Oshima-cho. The wall round the Shinseiza Theatre at Nakacho fell on a woman with such effects that she is not expected to live. Another death is reported through falling walls at Kiyozumi-cho. In this district, where there are many manufactories, no chimney over 120 feet is in a satisfactory condition; those at Onagigawa Rice Hulling and Powdering Works, the Brick manufactory, the Suzuki Cement Works, and Marugoshi Rice Hulling Works, were broken off in the middle.

A FIRE NEAR TOKYO.

A fire broke out at the Oshima-mura Kerosene Manufactory, Minami-Katsushika-gun, about the same time as the earthquake. Though it continued to burn for a long time, nothing has yet been ascertained with respect to the cause and extent of the fire.

TELEGRAM FROM THE IMPERIAL HOTEL.

In connection with a statement made in the Tokyo papers, to the effect that the Imperial Hotel had suffered from yesterday's shock, we have received the following telegram from the management:—

Though the Japanese papers state that some persons were injured at this Hotel, we request you not to publish the statement as no persons were injured here.

CENTRAL METEOROLOGICAL OBSERVATORY.

The following are the reports so far received at the Central Meteorological Observatory, Tokyo.

Tokyo:—

Time.—20th, 2.04.10 p.m.

Duration.—4 mins. 48 secs.

Direction.—S.W. to N.E.

Maximum Horizontal Motion.—76 mm. in 1.3 sec.

Maximum Vertical Motion.—18 mm. in 1.0 sec.

Nature.—Sudden.

Remarks.—The horizontal and vertical motions arose at the same time, and after 7 seconds, the maximum horizontal motion was reached, and continued for 17 seconds, and then began to diminish in force until it became imperceptible.

Yokosuka	2.04.20—Strong.	
Numazu	2.03.25—Strong.	
Utsunomiya ...	2.04.16—Strong.	
Mayebashi	2.05.00—Strong	} Pendulum clocks stopped.
Kofu	2.03.00—Strong	
Choshi	2.04.00—Weak.	
Nagoya	2.04.44—Weak.	
Gifu	2.04.28—Weak.	
Hikone	2.01.27—Weak.	
Osaka	2.04.00—Weak, Clocks stopped.	
Fukushima	2.04.27—Weak.	
Aomori	2.06.00—Slight.	
Sakai (Tottori) ..	2.07.00—Slight.	

All the instruments at the observatory were damaged, and both the seismograph and

seismometer were destroyed. According to a member of the Observatory, the shock on Wednesday was severest in Tokyo and Gumma-ken, and the centre of the earthquake must be within these two prefectures; but as there is no meteorological station in Gumma-ken, there is no means of ascertaining the strength of the shock in that province. Wednesday's earthquake is believed to have been more severe than that of 1855, but being of shorter duration, it was less disastrous than that famous calamity. The area of the shock was also small.

SCIENCE COLLEGE'S REPORT.

Wednesday's earthquake was the severest experienced since the establishment of the seismometrical laboratory at the Tokyo University in 1880. The observations taken at the Imperial University at Hongo were as follows:—

Time.—About 2.02.30 p.m.

Horizontal motion.—At first it was slight, but in ten seconds it became very severe, giving a maximum horizontal motion of 80 mm. per sec. This was the most marked motion, followed by more than ten severe shocks. The severest motion lasted for a minute.

Vertical motion.—The maximum vertical motion arose at the same time as the maximum horizontal motion, being 10 mm. per sec.

Horizontal Vibration.—The period of vibration of the maximum horizontal motion was a little less than 2 secs.

Direction.—The direction was rather complicated, but was on the whole from S.W. to N.E.

Maximum Acceleration.—Calculating from the maximum horizontal motion and vibration, the maximum acceleration was from 400 to 500 mm. per sec.

This ratio is used in measuring the destructive power of an earthquake. The maximum acceleration in the great Gifu-Aichi earthquake ranged from 3,000 to 8,000 mm. per sec.

OBSERVATIONS AT HITOTSUBASHI, KANDA.

Horizontal motion.—130 mm. per sec.

Vertical motion.—45 mm. per sec.

Period of a Vibration.—about $1\frac{1}{2}$ sec.

Maximum Acceleration.—1,000 mm. per sec.

Duration.—about 5 min.

These observations were taken on seismometers for observing great shocks. From the great vertical motion and the suddenness

and long duration of the shock, the centre of the earthquake was probably in close proximity to Tokyo. At the University, there is a column, on the top of which 8 leaden balls, about 2 inches diameter, are placed to take a rough estimate of the magnitude of a shock. Up to Wednesday, the balls had never fallen from the column; but on Wednesday they all fell, except one on the North-East corner. As the soil of the University, like those of the higher parts of the city, consists of rather hard loam, the shock was slighter than on the softer earth of Hitotsubashi and the lower town. At the centre of the earthquake in Aichi and Gifu in 1891, the horizontal motion was about 5—9 inches. And the fact that on Wednesday's shock, though of great horizontal motion, was comparatively less disastrous, was due to the fewness of severe shocks. Wednesday's earthquake down-town was similar in nature to that of Nemuro and Kushiro, in Hokkaido, a few months ago; and it was slighter than that of Kumamoto in 1889. As is usual with great earthquakes, slighter after-shocks must be expected for some days.

GREAT EARTHQUAKES OF TOKYO.

The number of great earthquakes which caused great loss of life and property since 1627 is seven, giving an average of one every 38 years. Since the last great earthquake took place in 1855, the present year being the 39th after that calamity, such a shock as occurred on Wednesday was only to be expected.

(From Friday's "Gazette.")

We are kindly informed by Dr. Rokkaku that those severely injured at No. 258, by the earthquake, are not without hope of recovery, with the exception of a few. Kimura Chuzo, the injured jinrikishaman of the Italian Consulate, who could at first neither speak nor

move, is progressing. The punctured fracture on his head has been trephined, and he can now freely move his limbs excepting his left foot.

EARTHQUAKE IN KANAGAWA-KEN.

There were slight damages only in the rural districts of Kanagawa-ken, except in Tachibana-gun. A stone-wall, nine feet high and 120 feet long, behind the temple of Heigenji in Daishi-gawara-mura, fell the whole length. Two little girls, aged 11 and 9, and a boy aged 8, were crushed to death, as they were passing beside it on their way home from school. Four godowns collapsed, 28 more were cracked, three roofs were deprived of their tiles, and two sheds inclined dangerously. The chimneys of a local shoe-manufactory and the Japan Silk and Cotton Spinning Co. were knocked down. The railway between Hodogaya and Totsuka was damaged.

DAMAGES IN KANAGAWA-KEN.

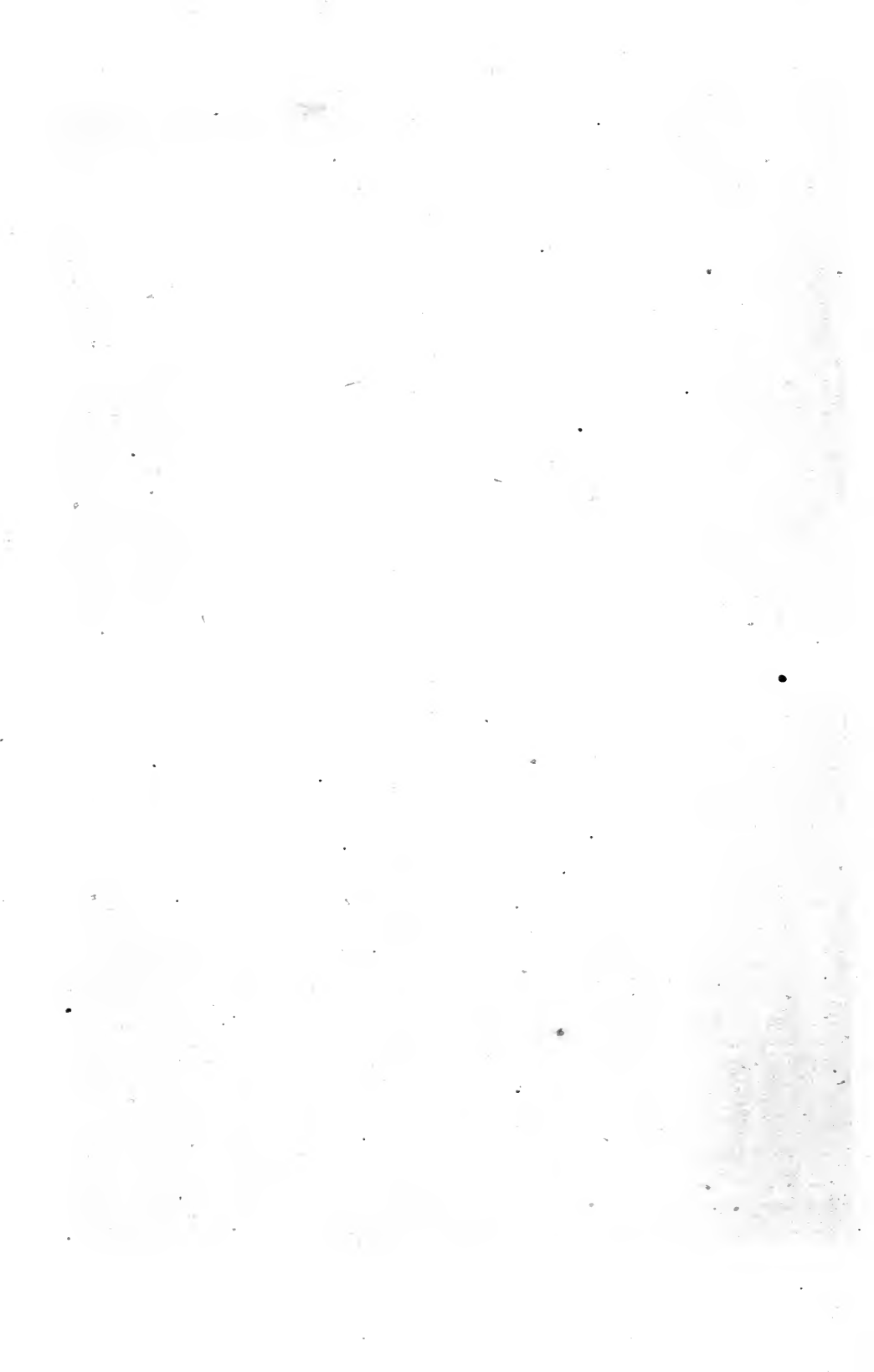
The returns made by the Kanagawa Kencho are as follows:—

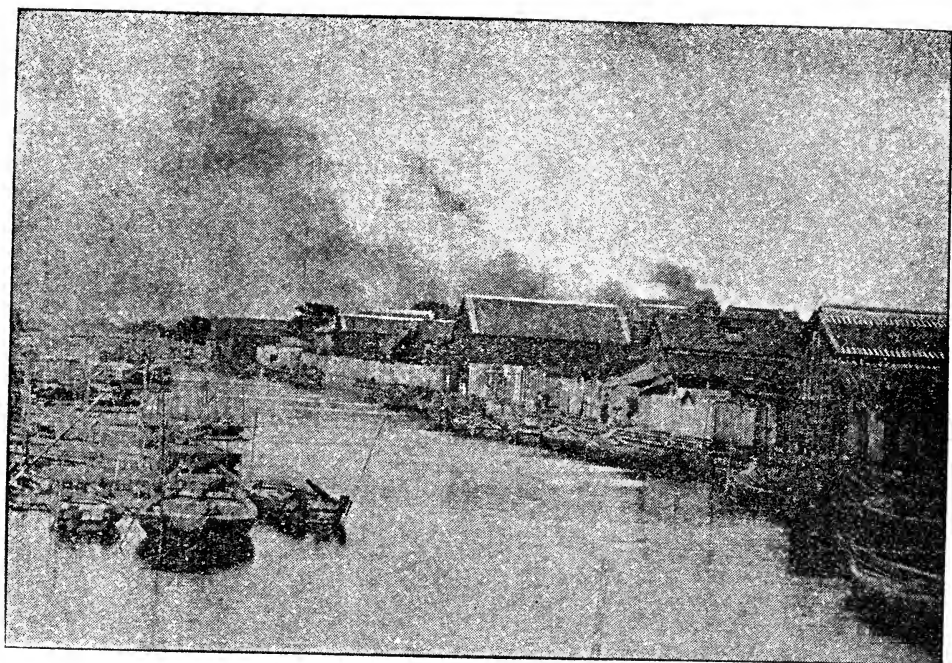
Killed	...	...	...	...	...	...	...	...	6
Seriously Injured	...	...	...	...	...	...	...	...	8
Slightly Injured	...	...	...	...	...	...	...	...	27
Houses Damaged	...	...	...	...	...	...	...	...	127
Godowns Damaged	...	...	...	...	...	...	...	...	98
Chimneys Destroyed	...	...	...	...	...	...	...	...	67
Ground-Cracked	...	...	...	...	...	...	...	...	2
Stone-banks Destroyed	...	...	...	...	...	...	...	...	5
Water-conduits Destroyed	...	...	...	...	...	...	...	...	4
Buildings (not Dwelling Houses) Damaged	...	...	...	...	...	...	...	...	13
Embankment Damaged	...	...	...	...	...	...	...	...	1
Hill-sides Fallen off	...	...	...	...	...	...	...	...	19

SCIENCE COLLEGE'S REPORT.

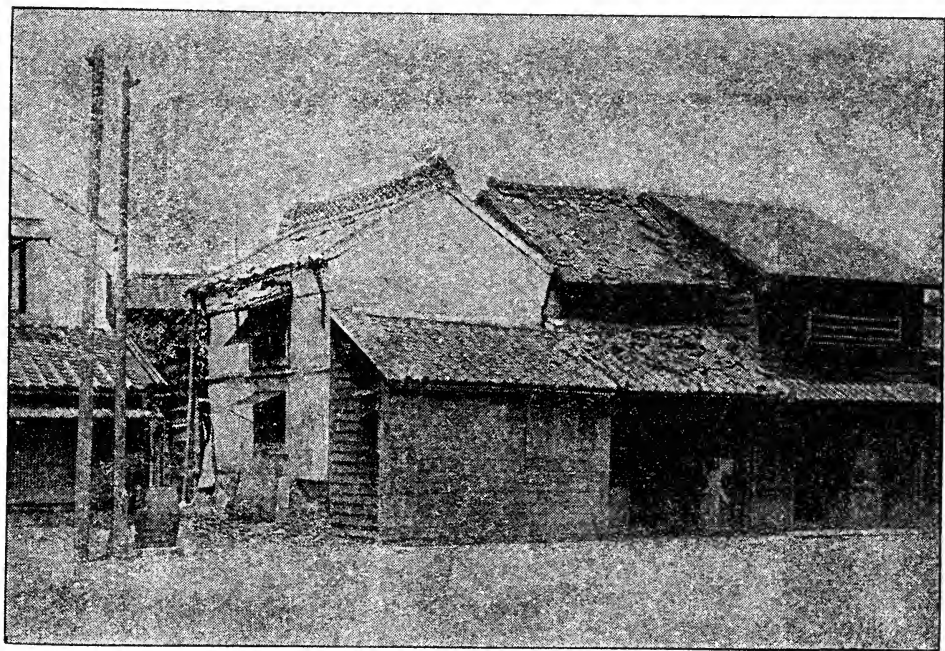
According to a report issued on Thursday by the Seismological Department of the Science College, though nothing can be predicted with certainty as no method has yet been discovered to forecast an earthquake, examination of old records and its own experience establish







FIRE AFTER THE EARTHQUAKE AT A TOKYO KEROSENE REFINERY.



SCENE AT SAKAICHO, TSUKIJI, TOKYO.



the fact that the severest shocks almost always occur first, followed by others of less violence. It may, therefore, be asserted with some degree of certainty that no great shocks will occur after the late earthquake as results of the same earth-disturbance. Though it is usual after great earthquake to have numerous little shocks, since 2.05 p.m. on Wednesday, there was only one each at 4.20 and 9.33 on the same day. The seismological instruments show that the disturbance has almost entirely subsided.

According to the local reports received at the Central Observatory, the region of severe earthquake covers the whole of Musashi, Sagami, Kozuke, and Kai, southern portion of Shimotsuke, part of Hitachi, north-western portion of Shimosa and Kazusa, eastern portion of Suruga, and northern portion of Izu. The region of weak shocks was bounded on the north-east by Rikuzen and Uzen, and on the west by Settsu, Tamba, and Tango; while the outer region of very slight shocks were bounded by the southern portion of Mutsu on the North-east, and on the west by Izumo, Aki, the eastern portion of Sanuki and Tosa. Thus the extreme north-eastern portion of the main island, Hokkaido, Kyushu, the western portions of Shikoku and the Middle provinces did not feel the earthquake at all.

The Science College's instruments at the Kwannonsaki Lighthouse gave the following readings:—

Maximum Horizontal Motion.—19 mm.

Period of Vibration.—1.2 sec.

Principal Direction.—N.W. to S.E.

Maximum Acceleration.—270 mm. per sec.

Maximum Vertical Motion.—2.5 mm.

Direction of strong shocks.—1 m. 2 secs.

From this, it will be seen that the shock at Kwannonsaki was of less magnitude than at Hongo and Hitotsubashi. The soil under the lighthouse consists of soft rocks of the Tertiary Period.

THE EARTHQUAKE IN TOKYO.

Mr. Kamei Eisaburo, Councillor of the Legislative Bureau, was sitting at his table near a fire place, when the earthquake took place. Hearing the chimney knocked down, he rushed to the window and jumped out. He was severely struck in the hip.

The wells in Honjo and Fukagawa have become muddy, and unfit for drink; and even those which cleared soon after, taste of iron. At Futabachio, Honjo, the ground cracked to the length of 16 yards and emitted water to the height of three feet for some hours. Many of the stone-lanterns in Shiba and Uyenoh Parks have fallen. The great granite *torii* of the shrine of Sanno, in Kojimachi-ku, fell and broke into many pieces.

Though carpenters have comparatively little work, masons are in great request for replastering walls. They are to be the people who will gain most by the earthquake. Next to them come tilers. Tiles and roof-boardings have gone up 5 to 10 per cent. in price, with a corresponding rise in the wages of masons and tilers.

All the officials injured will be medically treated at the expense of their respective departments, while the University and the Redcross Hospitals have offered to treat gratis those injured by the earthquake, who are too poor to pay.

Great anxiety was felt on the state of the prisoners at the prisons; but at the Kosuge prison, there was no accident, nor did any prisoner attempt to escape; but near the prison the ground cracked, producing a gap five feet and a half long and $1\frac{1}{2}$ inches wide, out of which muddy water was ejected. At Kanda, there was a crack over 60 yards long, while at Hatagoya, Higashi-Tama-gun, many gaps were seen, ranging from 6 to 14 yards. There are many similar cracks in Shiba and the suburbs.

At the Keio-Gijuku, Mr. Fukuzawa's great school, bottles of sulphuric acid were knocked down in the chemical laboratory; and a fire was threatened, but was instantly put out with the college pump.

KEROSENE WORKS ON FIRE.

The kerosene refinery at Oshima-mura, in Minami-Katsushika-gun, was set on fire by the shock. The damage to the plant and buildings is put at 30,000 yen; and 3,000 cases of kerosene, valued at 6,000 yen, were consumed. The works were insured for 10,000 yen.

ACCIDENT AT THE ARSENAL.

Shirane Yurizo, aged 39, had entered the Arsenal in 1876, and by his long and faithful service had gained the confidence of the officials. He received 80 or 90 sen a day. He was in the small-arms fitting shop, on the second floor, and when the shock took place, he jumped out of the window on to the roof of a engine-house. But as he had boots on, his feet slipped and he fell on the ground. He struck his forehead and fainted. He was taken on a shutter to the surgeons' office, but died immediately after. He leaves behind a wife and two children.

TOKYO COTTON MILL.

Between the two mills at the Tokyo Cotton Spinning Co.'s works at Higashi-Daiku-cho, Fukagawa, was a tank, 15 feet square and 60 feet high. As it fell through the shock, it knocked against the roofs of both mills, and made big holes in the ceilings of the second stories. The men and women cried for help. In one mill, a big piece of the brick-wall, weighing over a ton, fell on a boy of 19, and killed him on the spot; while in the other, an old woman and two young girls were killed by falling bricks. Fourteen others, two young men and twelve girls, were hurt. A boy and a woman were killed by the falling of a chimney at Mr. Asano's Cement Works.

HON-HATCHOBORI.

At Hon-Hatchobori, Kyobashi-ku, Koyama Tokumatsu had built a strong brickwall, 15 feet high and 42 feet long, to his bath-house. On the other side of the wall was a block of six small houses; and beside them was a godown. When the earthquake took place, the wall fell and with it the godown also gave way. They both crushed the block. The inhabitants rushed out in terror. Of these, Yoshida O-Shio and her two children, in the house No. 1, Yokoyama O-Take in No. 2, Komatsu Tomoye in No. 3, Nakamura Tomekichi, a boy of eight, in No. 4, Kubota O-Ume, in No. 5, and Shibata O-Yasu in No. 6, with another woman, were knocked down by falling beams or walls and buried as they attempted to run out. They were struck on the head, dislocated their hips, or lost consciousness. Their cries brought their neighbours to their aid. They were extricated, but seriously hurt. Doctors were called. O-Ume was sent to the Tokyo Charity Hospital as her injuries were very great. Koyama, feeling sorry at the accident caused by his wall, removed the families to other houses in his possession, while five of the injured women are being nursed at his house.

THE ASAKUSA TOWER SAFE.

One of the first buildings people thought destroyed was the Ryouunkaku, the twelve-storied tower at Asakusa. It was even rumoured that it had snapped at the fourth storey, with terrible injuries to those within. Both the police and gendarmes appeared to be equally anxious on the fate of the tower; and immediately after the shock, over twenty of them went up to the tower. They found there over 30 visitors, and 15 girls from 13 to 17, engaged at the stalls. They all remained still with pale faces, expecting to be killed every moment. The police helped them out; and fortunately no accident took place. There were small cracks at the fifth, sixth, and seventh stories.

THE EARTHQUAKE IN THE PROVINCES.

NAGANO-KEN.

Nagano, 20th, 8.22 p.m.

About the same time as the Tokyo earthquake, there was a strong shock in Saku District. Though many walls fell off, so far no report has been reported of death or injury. Mount Asama shows no extraordinary symptoms.

GUMMA-KEN.

Mayebashi, 20th, 9.17 p.m.

To-day's severe shock was most strongly felt in the districts south of Mayebashi. Most godown-walls have fallen off, and there is scarcely a stone wall unaffected.

YAMANASHI-KEN.

Kofu, 20th, 8.25 p.m.

There was a severe shock at 2.05 p.m. Walls were damaged, but no death or injury is reported from the neighbourhood.

FUKUSHIMA-KEN.

Fukushima, 20th, 8.40 p.m.

There was a shock here, but nothing serious.

NIIGATA-KEN.

Niigata, 20th, 8.55 p.m.

There was a slight shock this afternoon.

TOCHIGI-KEN.

Utsunomiya, 20th, 9.0 p.m.

There have been three shocks since the morning, the severest being at about 4.0 p.m. People ran out of their houses. In the villages, however, damages were comparatively slight.

SHIZUOKA-KEN.

Shizuoka, 20th, 9.05 p.m.

There was a strong shock at 2.0 p.m. but nothing serious has taken place. In the districts, too, little damage has been done.

AICHI-KEN

Nagoya, 20th, 8.20 p.m.

There was a shock at about 4.0 p.m., but nothing serious.

OFFICIAL REPORTS.

TOKYO PREFECTURE.

The earthquake of the 20th inst. was the severest since 1855; and the damages done were also great. On the whole, the greatest damages were done down-town, while they were comparatively slight on the suburban hills. Again, stone and brick buildings and godowns suffered most, while wooden houses generally escaped with fallen tiles. Eight-tenths of the damages done were suffered by the former class of buildings; but the Ryounkaku at Asakusa were not injured except for slight cracks.

Two-tenths of the killed and injured met with the accidents through their confusion in attempting to run out of their houses.

Numerous stone *torii*, stone lanterns, and gravestones were knocked down in the various districts.

Cracks in the ground were caused in 15 places at Aoicho and Tamachi Rokuchome and Shichichome, in the Akasaka Police limits; in one place at Sarugakuchō, under the Kanda police; in 38 places in Shiba; and in from one to three places in Yotsuya, Shinjuku, Fukagawa, and Komatsugawa. At Komatsugawa, black sand was thrown up, while a crack in Fukagawa was three feet wide, and emitted water and sand. These cracks varied in width from $1\frac{3}{4}$ inches to 5 feet, and in length from two feet to 180 feet.

At Tamachi Rokuchome, Akasaka, about 60 feet of the ground near the drains were slightly depressed.

There was one fire through the earthquake. At the Kerosene Refinery, in the Komatsugawa Police limits, an oil-case fell into a hearth, and exploding, set the place on fire. The manufactory and two dwelling-houses were burnt down.

The total damage done was as follows:—

Deaths—		
Male	9	20
Female	11	
Injured—		
Male	79	140
Female	61	
Horses—		
Killed	2	3
Injured	1	
Houses—		
Destroyed—Inhabited	11	18
Destroyed—Uninhabited	7	
Half-destroyed—Inhabited	17	37
Half-destroyed—Uninhabited	20	
Damaged—Inhabited	1,736	33,940
Damaged—Uninhabited	32,204	
Walls Damaged		171
Telegraph Poles overturned		1
Boats Damaged		6
Roads Damaged; length, 15 feet		6
Stones-wall Destroyed		42
Hillsides Destroyed		13
Drain and Water-pipes Damaged		5
Bridges—		
Destroyed	1	4
Damaged	3	
Ground Cracked	94	95
Subsided	1	
Chimneys—		
Knocked Down	90	271
Damaged	181	

SAITAMA PREFECTURE.

The damages done in this prefecture, so far as were known on the 22nd, were as follows:—

Injured	3
Prefectural Buildings Damaged	4
Public Buildings Damaged	2
Dwelling-houses Damaged	70
Godowns—	
Destroyed	2
Damaged	29
Chimney Destroyed	1
Walls Damaged	2
Torii Destroyed	1
Stone-lanterns Destroyed	12
Embankments Damaged; length 640 yards..	2
Roads and Fields Cracked	59

At Kasawara-mura, in Kita-Saitama-gun, water and green sand issued from a crack, while at Jokoji-mura, Kita-Adachi-gun, greyish sand and muddy water were seen; and at

Sakurai-mura, Minami-Saitama-gun, only sand was emitted. One well spouted sand for some time and became dry.

GUMMA PREFECTURE.

On the morning of the 20th, it was extremely hot, though nothing extraordinary was noticed in the weather. At 2.05 p.m., there were two severe shocks within two minutes. It is considered the severest shock since 1855. At the Isobe mineral springs, in Usui-gun, about 6 feet square of the wall of an old godown was shaken down, while at Takasaki Town, the tiles and walls of godowns fell off, and three feet of the roofs of the houses built against these godowns were also knocked down, and clock pendulums were also stopped. At Isezaki Town, two or three window panes were smashed. People mostly ran out of their houses.

NAGANO PREFECTURE.

The earthquake of the 20th was severest in Saku-gun. It took place at 2.05 p.m. At first it was gentle, then became very severe, and finally died away gradually.

About Iwamurata and Karuizawa, there were cracks in the walls of houses and in the ground. Articles were knocked down from shelves. In some old houses the lintels came down. Top-heavy gravestones at the Seinenji Cemetery, in Iwamurata, were knocked down; and in the same town a lightning conductor was snapped in two. People ran out of their houses, women and children crying aloud; but no one was hurt or wounded.

MOUNT ASAMA.

A report from the Nagano Prefectural Office states that nothing was noticed on Wednesday morning beyond that there was a little less smoke than usual issuing from the crater of the mountain, and in the evening at 6, there was a strong smell of sulphur about Fumikake.

PROF. SEKIIYA ON EARTHQUAKES.

DIRECTION OF THE GREAT EARTHQUAKE.

Professor Sekiya, the chief Japanese authority on seismology, was interviewed on Monday by a reporter of the *Jiji*. Before Mr. Sekiya spoke, Mr. Omori Fusakichi, Lecturer at the Science College, showed the reporter a table showing the direction in which the stone-lanterns had fallen in Tokyo. Out of 124, 72 had fallen to W.S.W., and 24 to E.N.E. From this it was clear that the direction of the earthquake was W.S.W. to E.N.E.

THREE KINDS OF EARTHQUAKES.

Professor Sekiya then said that the earthquake of Wednesday, the 20th June was severest from Utsunomiya on the North to Kwannonsaki on the South, so that the centre of the shock was near Tokyo. There are three kinds of earthquakes, those caused by volcanic eruption, by land depression, and by land-slips. Though the first causes serious damages at the foot of the volcano, the shock does not extend to a great distance and endanger life and property in remote parts. When Mt. Fuji burst and Mt. Hoyei was formed, the shock, it is said, was not felt at a great distance. The second kind takes place most frequently in Switzerland. Thermal springs issue out of the earth, and cause a vacuum in the strata, whereupon the upper stratum falls in and fills it. The centre of the earthquake in that case is always near a hot spring. The third kind is caused by the shrinking of the earth through dissipation of its heat. The first two are seldom very severe, but the last is the most dangerous. The late earthquake, as well as that of 1885, was of the third kind. Greatest damages were suffered in 1855 and the other day in Honjo and Fu-

kagawa, the soil of which is very soft. The centre of last Wednesday's earthquake must have become depressed, though slightly.

FREQUENCY OF EARTHQUAKES.

The oldest earthquake on record in this country took place on the 14th day of the 7th month of the fifth year of the 20th Emperor Inkyo's reign (416 A.D.) Since then, the number of earthquakes which overturned and damaged houses, depressed and brought down land, and injured men and cattle, is 121, or an average of one in 12 years and 5 months. Those which are merely called great earthquakes are 237 in number, or one in six years and four months. These two kinds make a total of 358, or one in four years and two months. It is erroneous to suppose that earthquakes regularly take place once in 38 years, for sometimes there are no great shocks for a hundred years together, while at other times they take place annually. There is, therefore, no such thing as periodicity in the occurrence of earthquakes. Though there are no fixed seasons when they take place, they are a little more frequent in winter than in summer.

PRECAUTIONS IN HOUSE-BUILDING.

The destruction of buildings by earthquakes is due, first to the motion of the earth, and secondly to the motion imparted by it to the buildings themselves. In the case of high towers, for instance, their own induced motion is greater than the earthquake and is the cause of their destruction. Theoretically speaking, then, the best buildings are the simplest. Such are square and long houses. It is most dangerous to connect a single-storied house with a two-storied one, or with a tower, for being of different heights, their motion varies and will cause their disconnection. And then, by knocking against each other, the two buildings will come to pieces. It is best to build them separately, but if artistic requirements make their connection

necessary, the joints should be most firmly constructed, so that they may not feel the shocks.

CONSTRUCTION OF CHIMNEYS.

The large number of chimneys that have come down shows that their construction was defective. Prof. Sekiya built his own chimney with bricks up to the roof of the house, above which he used an iron column. This mode of construction is, he adds, being pursued in Yokohama, as it is far safer than the usual brick stacks.

FOUR GREAT EARTHQUAKES.

We may add that Messrs. Wada and Baba, of the Central Meteorological Observatory, give the four great earthquakes of the last five years in the following order of magnitude :—

I. Aichi-Gifu	Oct., 1891
II. Kumamoto	July, 1889
III. Nemuro	April, 1894
IV. Tokyo	June, 1894

ESTIMATED DAMAGE IN TOKYO.

The *Asahi* hears that the damages done in Tokyo have been estimated at over 120,000 yen ; but this appears to be far below the mark.





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